

PIPE THREADING  
AND CUTTING MACHINES

THE  
MERRELL  
MFG. CO.

TOLEDO  
OHIO.  
U.S.A.



*Catalogue of* PIPE THREADING  
and CUTTING MACHINES *♪ ♪*



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THE MERRELL MANUFACTURING CO.  
TOLEDO, OHIO, U. S. A.

SUPERSEDES ALL PREVIOUS ISSUES.



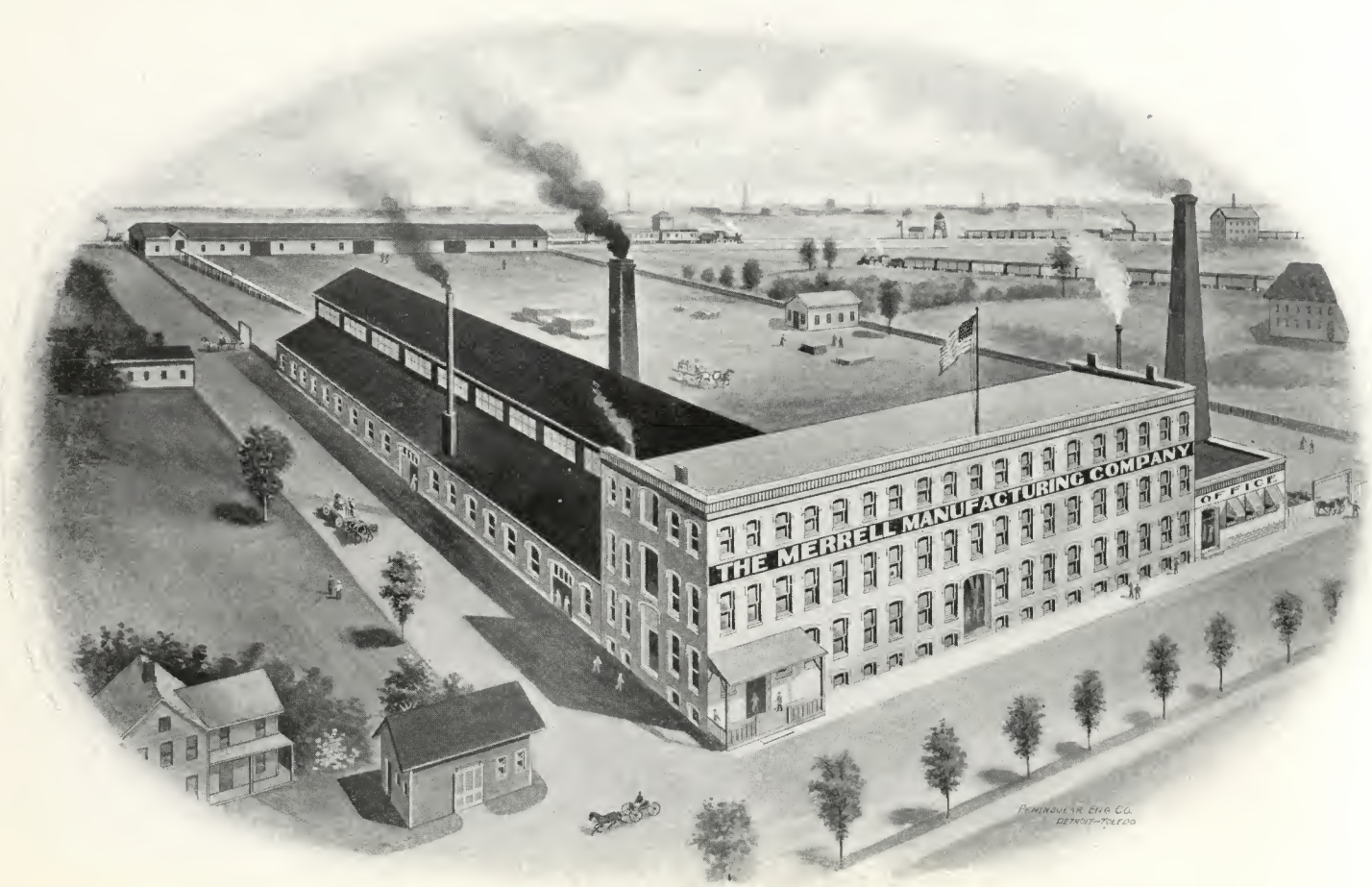
THE HADLEY  
PRINTING CO  
TOLEDO : OHIO



## Introduction

A DESCRIPTION of the different styles of Pipe Threading and Cutting Machines manufactured by us is given on page opposite cut representing the Machine. In design our Machines combine all that is latest and best for first-class Machines and are fully guaranteed as to construction. Their reputation for durability and rapidity of work is fully established and a trial of them will and should have greater weight with prospective purchasers than anything we can say on these pages. We ask you to investigate their merits.

**The Merrell Manufacturing Co.**  
TOLEDO, OHIO, U. S. A.



P. H. M. & CO.  
DETROIT-TOLEDO

UNITED STATES.

Department F—Machinery.

Exhibitor—Merrell Manufacturing Co. Address Toledo, Ohio 15361

Group 71, Class 433

Exhibit Pipe Threading and Cutting Machines.

AWARD.

The Hand Machine, the Power Machine and the Combined Hand and Power Machine for threading and cutting pipe are characterized by their efficiency in cutting many sizes of pipe with one set of chasers, and by the convenient means of readily changing the chasers to different sizes. In adjusting, the chasers can be quickly opened and positively closed. This combined arrangement of cutting and threading pipes, the adaptability of the machines to cut and thread many sizes of pipes with one set of chasers, and the quick means of changing the chasers for different sizes, is admirable.

(Signed) E. Blum, *Individual Judge.*

Approved: W. C. Unwin, *Vice President Departmental Committee.*

John Boyd Thacker  
[Signature]

Approved: \_\_\_\_\_  
*Chairman Executive Committee on Awards.*

Copyist A. M. C. Date May 24, 1894.

Subject to change of grammatical and typewritten inaccuracies.



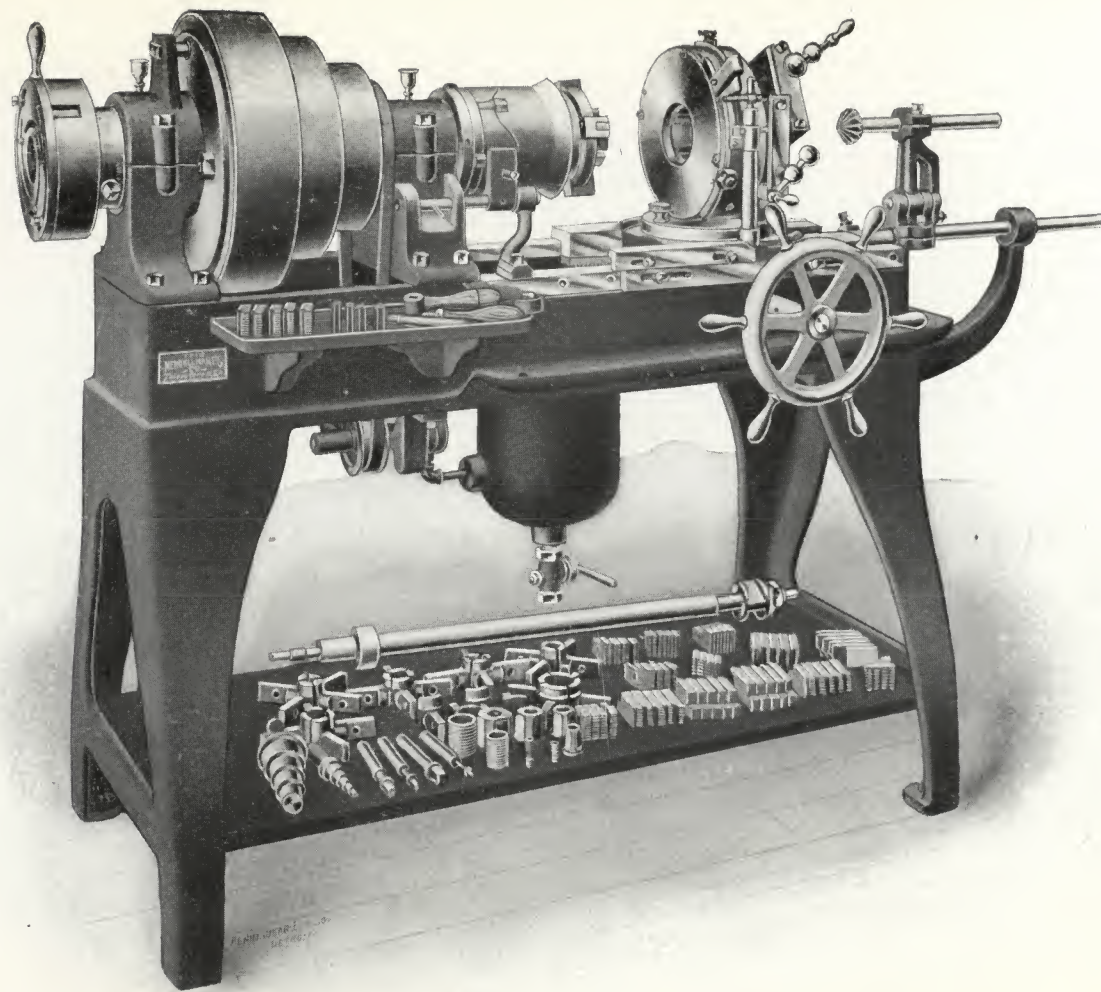


FIG. 2.





# A P E X M A C H I N E S .



FIGURE 2 represents our Apex Nipple and Pipe Mill Machine, which will thread nipples thread to thread, of all sizes within the range of the Machine. The gearing is entirely protected from dust, being inside of the machine cone, thus giving six different speeds with but a three step cone. The pump is out of the way of the operator, and can be changed so as to flood either the dies or the knife, or shut off entirely while the machine is in motion. The head has our Standard Adjustable Quick Opening and Closing Dies, actuated by a convenient cam movement, and is so swiveled that it can be reversed and the pipe cut off close to the grippers. The vice is opened and closed while the machine is in motion by simply moving a dog either forward or backward. The sleeve operating the vice is adjustable and can be adapted to the wear consequent upon long usage. The nipple grips can be closed on the threaded end of the pipe without injury to the thread, thus avoiding the necessity of screwing a nipple into the grips after they are closed; this is a feature that no other machine has. All Apex machines are furnished with a reamer to ream out the burr left by the cutting off tool. We furnish with this machine a threading gauge which works automatically and releases the chasers when the desired length of thread has been cut. It will make left-hand threads as well as right hand. The chasers are five in number and are set by graduation to any size desired; they are released from threading while the machine is in motion, opened to permit the pipe to pass through to the cutting-off knife, and closed instantly and positively. They can be sharpened by grinding, and readily replaced by chasers cutting any style or pitch of thread.

Apex No. 1 Machine with counter, eight sets of chasers, for $\frac{1}{4}$ inch to 2 inch pipe, inclusive, R. H. and automatic thread gauge. No nipple attachment.....	\$350 00
For Nipple Attachment add to list.....	100 00
Chasers, either R. or L., 5 per set.....	5 00
Extra Threaded Grippers, 4 per set.....	12 00
Extra Pipe Grippers, 4 per set.....	4 00
Tight and Loose Pulleys of Counter, 12x3 inches. Machine Pulley, 3-step Cone for $2\frac{1}{2}$ inch belt. Speed of Counter 300. Weight 1,200 lbs. Export shipping weight, 1,500 lbs. Cubic measurement, 45 feet.	
Apex No. 2 Machine, with counter, eight sets of chasers, for 1 inch to 4 inch pipe, inclusive, R. H. and automatic thread gauge. No nipple attachment.....	\$550 00
For Nipple Attachment, add to list.....	150 00

Chasers, either R. or L., 5 per set.....	5 00
Extra Threaded Grippers, 4 per set.....	18 00
Extra Pipe Grippers, 4 per set.....	5 00
Tight and Loose Pulleys of Counter, 14x5 inches. Machine Pulley, 3-step Cone for 5 inch belt. Speed of Counter, 160. Weight, 2,500 lbs. Export shipping weight, 2,800 lbs. Cubic measurement, 105 feet.	
Apex No. 3 Machine, with counter, for 1 to 6 inch pipe, inclusive, R. H., with automatic thread gauge. No nipple attachment.....	\$900 00
For Nipple Attachment, add to list.....	250 00
Extra Chasers, per set.....	8 00
Extra Pipe Grippers, per set.....	6 00
Extra Threaded Grippers, per set.....	25 00

In ordering Chasers give LETTER as well as size wanted. Lubricate the Chasers with lard oil.

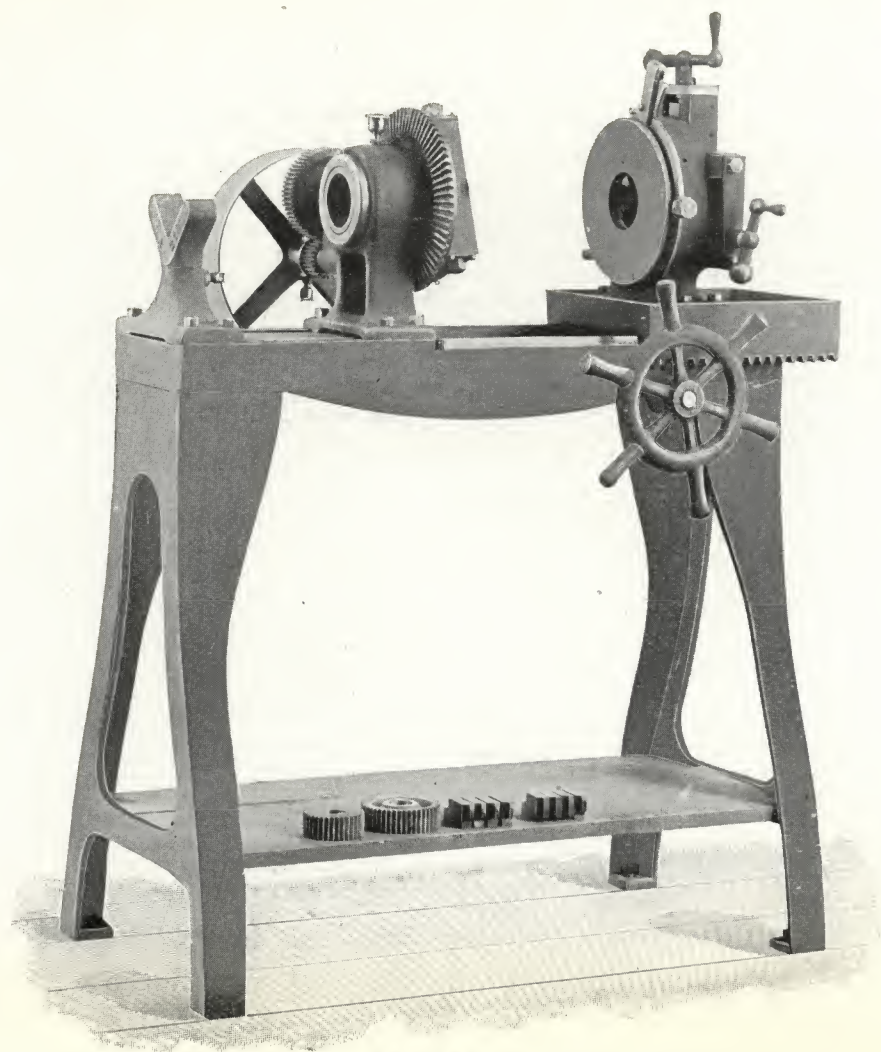


FIG. 3.

# **NO. 1 MACHINE**

Figure 3 represents our new pattern of No. 1 Pipe Cutting and Threading Machine. While retaining the good points of our old No. 1, we have added improvements that make it far preferable to the old machine. The pipe handled by this machine being so small that it requires no great amount of power to revolve it, we

have made the head stationary and revolve the vise. Power is applied by either belt wheel, or extensible crank by means of interchangeable gears graded to suit the work to be performed. The vice is self centering. The head is actuated by rack and pinion to feed the pipe into the chasers. The chasers are four in number, are set by graduation to any size desired. They are released from threading while the pipe is in motion, opened to permit the pipe to be cut off, and closed instantly and positively, one set being used to thread several sizes of pipe. They can be sharpened by grinding, and are readily replaced by chasers cutting any style or pitch of thread, either right or left.

No. 1 Machine, with interchangeable gears of four speeds, with three sets of chasers for $\frac{1}{4}$ inch to 2 inch pipe, inclusive, R. H. for hand.....	\$100 00
Fitted for power, including countershaft.....	120 00
For countershaft fitted for left-hand work on this machine, add to list .....	10 00
Extra Chasers, 4 per set .....	5 00
For oil pump with machine, add to list.....	20 00

Tight and Loose Pulleys of countershaft 12x3 inches. Machine Pulley 12x3 inches.

Speed of countershaft should be about 300.

Weight, 500 lbs. Export shipping weight, 850 lbs. Cubic measurement, 17 feet.

In ordering Chasers give LETTER as well as size wanted. Lubricate Chasers with lard oil.



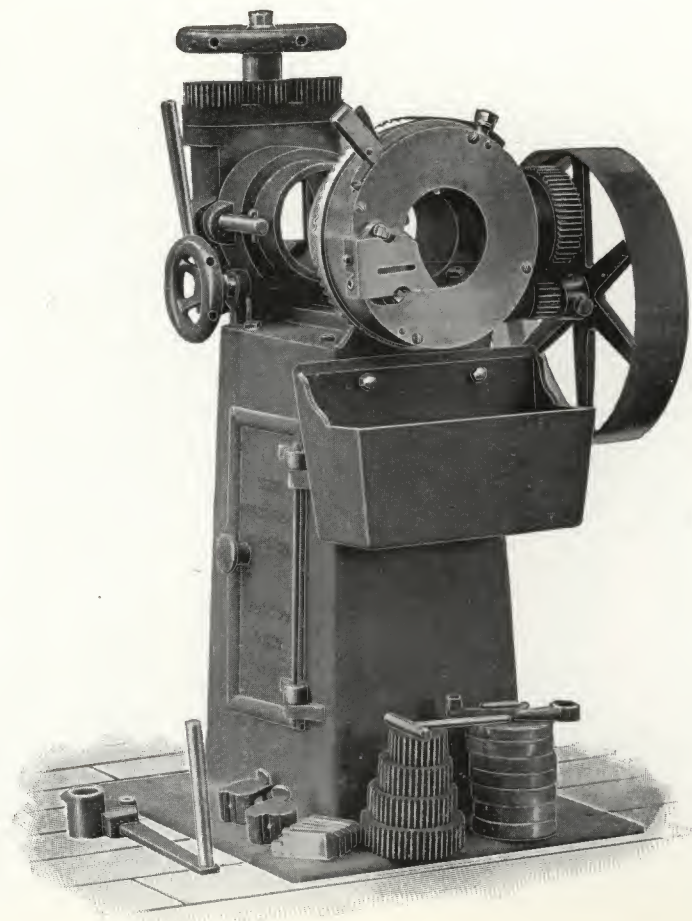


FIG. 4.

## NO. 2 MACHINE

Figure 4 represents our No. 2 Hand and Power Pipe Threading and Cutting Machine. It has our Standard Adjustable Quick Opening and Closing Die Head, actuated by a convenient cam movement. Power is applied by either belt wheel or extensible crank, by means of interchangeable gears, graded to suit the work to be

performed. The chasers are five in number; are set by graduation to any size desired. They are released from threading while in motion, opened to permit the pipe to be cut off, and closed instantly and positively; one set being used to thread several sizes of pipe. They can be sharpened by grinding, and are readily replaced by chasers cutting any style or pitch of thread, either right or left. The cutting-off knife is always in position, is guaged to prevent over-feeding or plunging through uneven pipe, and feed to its work by retaining the lever against the rotation of the die head. The vise is self-centering; is actuated by a rack and pinion to feed the pipe into the chasers. This machine has greater range of work, with quicker change from size to size of pipe than any other machine on the market.

No. 2 Machine, with interchangeable gears of six speeds, with two sets of chasers, for 1 inch to 4 inch pipe, inclusive, R. H. for hand.....	\$145 00
Fitted for power, including countershaft, R. H.....	175 00
Countershaft for cutting left hand on this machine, add to above list.....	10 00
Extra Chasers, 5 per set .....	5 00
For Oil Pump with machine, add to list.....	20 00

Tight and Loose Pulleys for countershaft, 12x3 inches. Machine Pulley, 16x3 inches.

Speed of Countershaft should be about 250.

Weight, 775 lbs. Export shipping weight, 1200 lbs. Cubic measurement, 27 feet.

In ordering Chasers give LETTERS as well as size wanted. Lubricate the Chasers with lard oil.

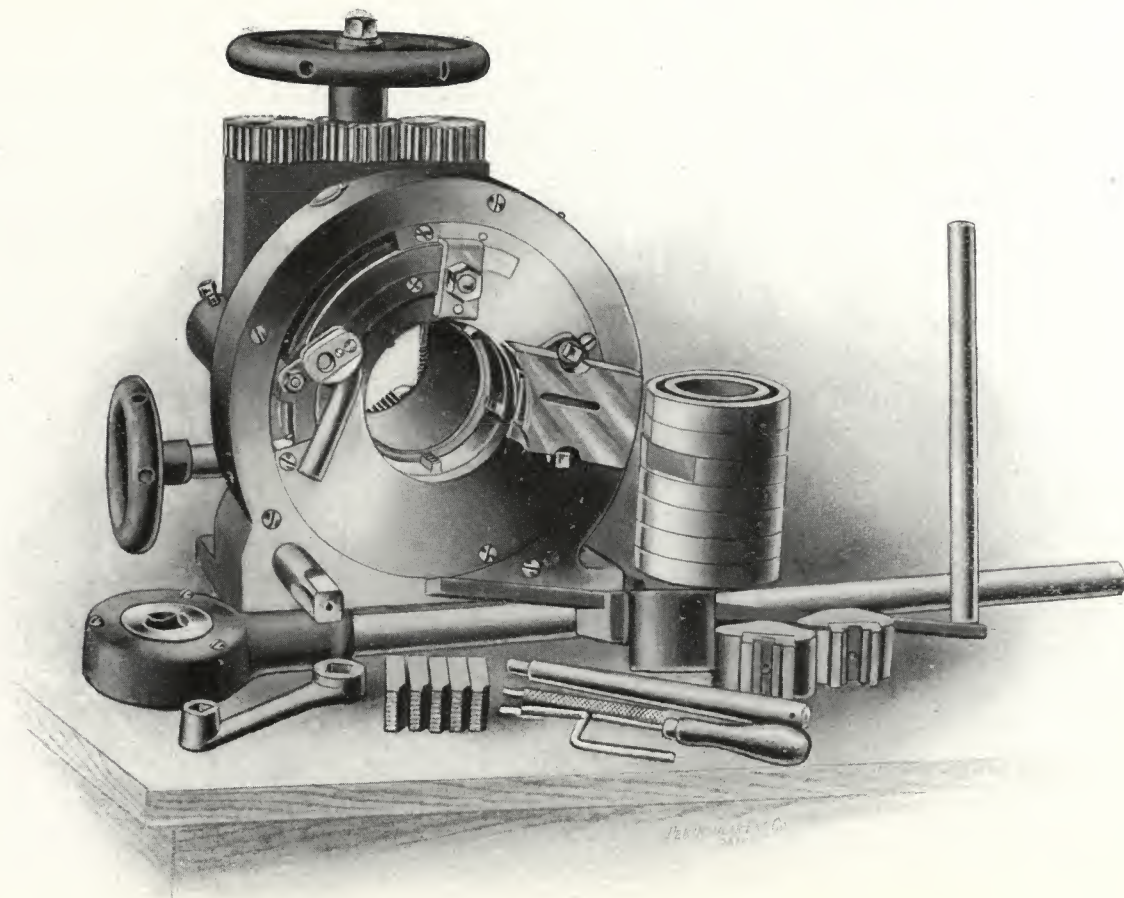


FIG. 5.



## NOS. 5, 6, 9, 11 MACHINES

Figure 5 represents our Nos. 5, 6, 9 and 11 Machines, a portable Hand Pipe Threading and Cutting Machine. Power is applied by either crank or ratchet lever to the shaft of the pinion, which engages the geared wheel enclosing the dies. The gears are completely housed from dust, and chips are not accessible to any part of the machine to its detriment. These machines have our Standard Adjustable Quick Opening and Closing Die Head, and our improved Cutting off Knife. The chasers are 5 in number for our Nos. 5 and 6 machines, and 6 in number for our No. 9 machine, and 8 in number for our No. 11 machine. They are set by graduation to any size desired, are released from threading, while in motion, opened to permit the pipe to be cut off, and closed instantly and positively, one set being used to thread several sizes of pipe. They can be sharpened by grinding, and are readily replaced by chasers, cutting any style or pitch of thread, either right or left. The vise is self-centering, is actuated by rack and pinion to feed the pipe into the chasers. These machines do better and more rapid work, both in threading and cutting off, than any other hand machine on the market. They have a greater range of work and quicker changes from size to size of pipe.

No. 5 Machine, with two sets of chasers, for 1 inch to 4 inch pipe, inclusive, R. H.....	\$100 00
Extra Chasers, R. or L., 5 per set.....	5 00
Weight, 275 lbs. Export shipping weight, 440 lbs. Cubic measurement, 6 feet.	
No. 6 Machine, with three sets of chasers, for 1 inch to 6 inch pipe, inclusive, R. H.....	\$190 00
Extra Chasers, R. or L., 5 per set.....	5 00
Weight, 390 lbs. Export shipping weight, 575 lbs. Cubic measurement, 10 feet.	

No. 9 Machine, with two sets of chasers, for 2½ inch to 8 inch pipe, inclusive, R. H.....	\$350 00
Extra Chasers, R. or L., 6 per set.....	8 00
Weight, 740 lbs. Export shipping weight, 965 lbs. Cubic measurement, 12 feet.	
No. 11 Machine, with three sets of chasers, for 4 inch to 12 inch pipe, inclusive, R. H.....	\$900 00
Extra Chasers, R. or L., 8 per set.....	18 00
Weight, 1500 lbs. Export shipping weight, 1700 lbs. Cubic measurement, 14 feet.	

In ordering Chasers give LETTERS as well as size wanted. Lubricate the Chasers with lard oil.

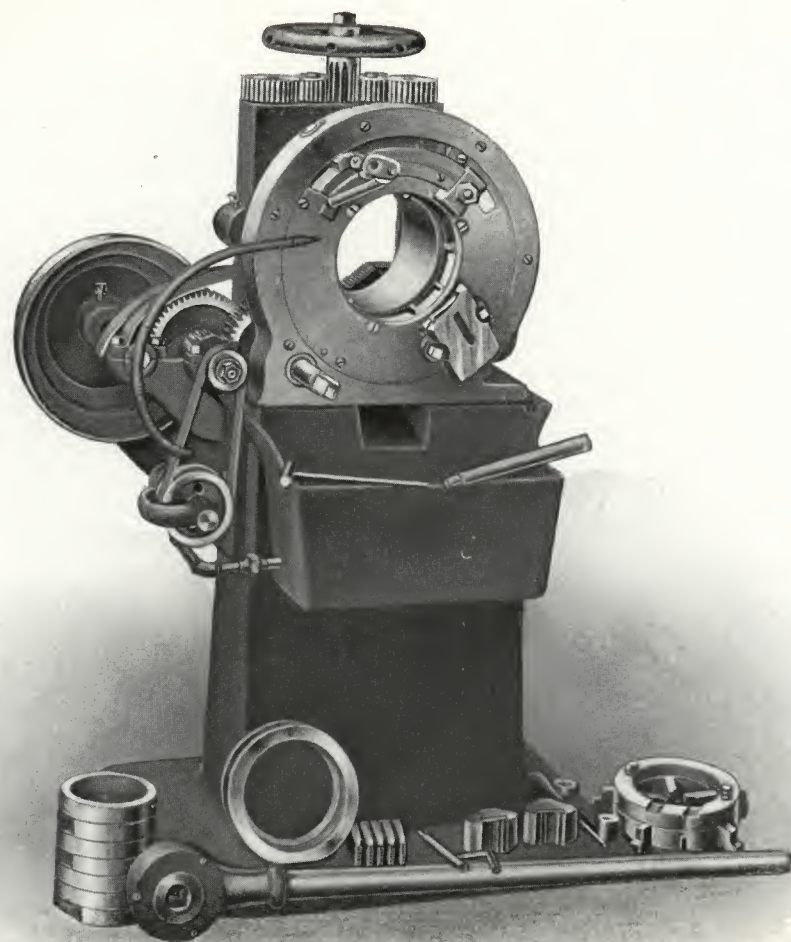


FIG. 6.

## Nos. 5 $\frac{1}{2}$ and 6 $\frac{1}{2}$ MACHINES

Figure 6 represents our Nos. 5  $\frac{1}{2}$  and 6  $\frac{1}{2}$  Combined Hand and Power Pipe Threading and Cutting Machines. These machines are the same as our Nos. 5 and 6 hand machine, except they are mounted on a base and driven by compound gears with cone pulleys, and are so arranged that either hand or power can be used at

will, or the machine can be readily taken from its base and used as a portable hand machine. The chasers and cutting-off devices are the same as used on the hand machine. The vice is self-centering, is actuated by rack and pinion to feed the pipe into the chasers. They occupy less floor space and will do better work than any other combined machine on the market.

No. 5  $\frac{1}{2}$  Machine, with counter, three sets of chasers, for 1  
inch to 4 inch pipe, inclusive, R. H. ....\$200 00  
Extra Chasers, R. or L, 5 per set..... 5 00  
Countershaft for cutting left-hand threads..... 10 00  
For Oil Pump with Machine add to list..... 20 00  
  
Tight and Loose Pulleys of counter, 12x3 inches Machine  
Pulley 3-step Cone for 1  $\frac{1}{2}$  inch belt.  
Speed of Counter 300.  
Weight 725 lbs. Export shipping weight 1175 lbs. Cubic  
measurement 29 feet.

No. 6  $\frac{1}{2}$  Machine, with counter, three sets of chasers for 1  
inch to 6 inch pipe, inclusive, R. H. ....\$300 00  
Extra Chasers, R. or L, 5 per set..... 5 00  
Countershaft for cutting left-hand threads..... 10 00  
For Oil Pump with Machine add to list..... 20 00  
  
Tight and Loose Pulleys of Counter, 12x3 inches. Machine  
Pulley 4 step Cone for 2 inch belt.  
Speed of Counter 300.  
Weight 1310 lbs. Export shipping weight 1840 lbs. Cubic  
measurement 42 feet.

In ordering Chasers give LETTER as well as size wanted. Lubricate the Chasers with lard oil.



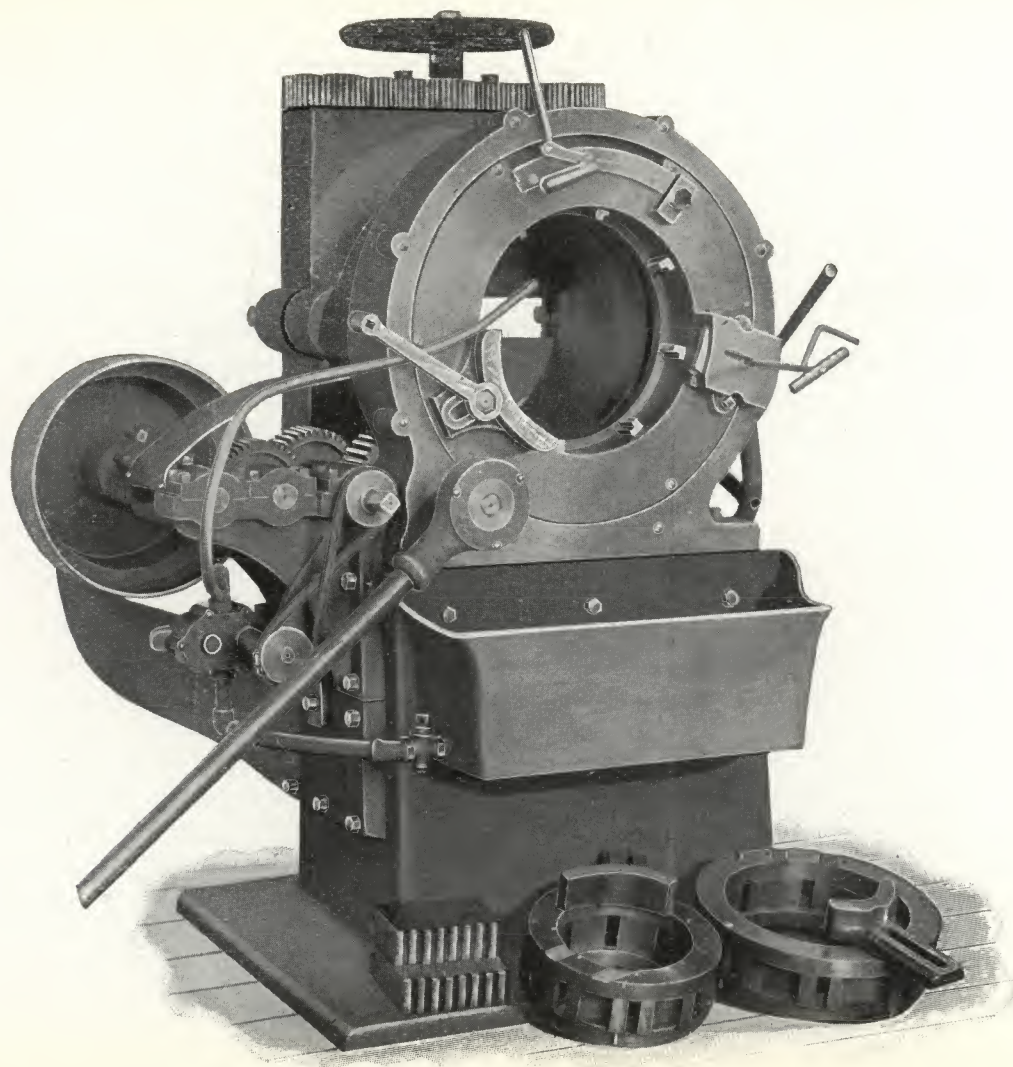


FIG. 7.

# **Nos. 9 $\frac{1}{2}$ and 11 $\frac{1}{2}$** **MACHINES**

Figure 7 represents our Nos. 9  $\frac{1}{2}$  and 11  $\frac{1}{2}$  Pipe Threading Machines, and are of the same class as our Nos. 5  $\frac{1}{2}$  and 6  $\frac{1}{2}$ . These machines when used as hand machines, are the only ones on the market that will cut and thread 8 and 12 inch pipe with ease and satisfaction to the operator. None of our machines so far mentioned have an arbitrary lead screw for determining the style or pitch of thread to be cut. A very valuable feature.

No. 9  $\frac{1}{2}$  Machine with Counter, three sets of chasers,  
for 2  $\frac{1}{2}$  inch to 8 inch pipe, inclusive, R. H.....\$550 00  
Extra chasers, R. or L., 6 per set..... 8 00  
For Oil Pump with Machine add to list..... 20 00  
Countershaft for cutting left-hand threads..... 10 00

Tight and Loose Pulleys of Counter, 12x3 inches.  
Machine Cone 4-step for 2  $\frac{1}{2}$  inch belt. Speed of Counter  
300. Weight 1540 lbs. Export shipping weight 2100 lbs.  
Cubic measurement 50 feet.

No. 11  $\frac{1}{2}$  Machine, with Counter, three sets of  
chasers, for 4 inch to 12 inch pipe, inclusive,  
R. H .....\$1200 00  
Extra Chasers, R. or L., 8 per set..... 18 00  
For Oil Pump with Machine add to list..... 20 00  
Countershaft for cutting left-hand threads..... 15 00

Tight and Loose Pulleys of counter, 14x5 inches.  
Machine Cone 4-step for 4 inch belt. Speed of counter 300.  
Weight 3300 lbs. Export shipping weight 4200 lbs.  
Cubic measurement 125 feet.

In ordering Chasers give LETTER as well as size wanted. Lubricate the Chasers with lard oil.

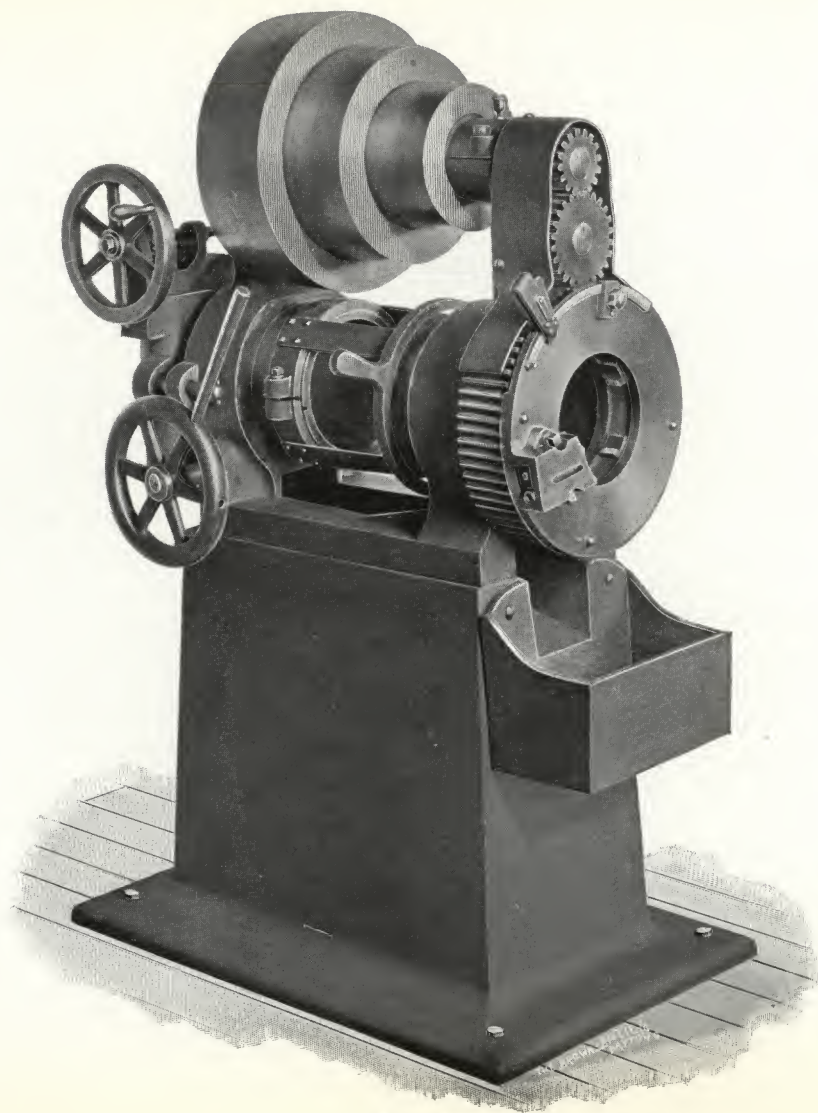


FIG. 8.



## Nos. 8 and 12 MACHINES

Figure 8 represents our Nos. 8 and 12 Power Pipe-Threading and Cutting Machines, designed for heavy persistent service, having our Standard Quick Opening and Closing Die Head, with convenient cam movement and improved Cutting-Off Knife. The cones are central over the machine, thus equalizing the weight, and placing the belt in the most convenient position. Within the cones are compound gears which

give six changes of speed, giving a maximum of 100 feet of 4 inch belt travel to one revolution of the chasers. These gears require no extra space, and are protected from dust or accident. The vice is self-centering and feeds the pipe into the chasers by a friction universal lead screw connecting the vice frame to the die head by a cam closing the lead nut onto the screw; a reverse movement of the cam releases the lead nut, or the pipe can be fed into the chasers by the hand wheel. The chasers are opened while threading, the threaded pipe removed, another inserted, cut-off and threaded without stopping the machine. These machines are designed especially for jobbers, machine shops and specialists, for which purpose we challenge competition for perfection, range and rapidity of work.

No. 8 Machine, with counter, three sets of chasers, for 1  
inch to 6 inch pipe, inclusive, R. H.....\$500 00  
Extra Chasers, R. or L., 5 per set..... 5 00  
For Oil Pump with Machine add to list..... 20 00  
Countershaft for cutting left-hand threads..... 10 00

Tight and Loose Pulleys of counter, 14x5 inches. Machine  
Cone 3-step for 4 inch belt. Speed of Counter 200. Weight  
1600 lbs. Export shipping weight 1900 lbs. Cubic measurement  
40 feet.

No 12 Machine, with counter, two sets of chasers, for 2½  
inch to 8 inch pipe, inclusive, R. H.....\$900 00  
Extra Chasers, R. or L., 6 per set..... 8 00  
For Oil Pump with Machine add to list..... 20 00  
Countershaft for cutting left-hand threads..... 15 00

Tight and Loose Pulleys of Counter, 14x6 inches. Machine  
Cone 3-step for 5 inch belt. Speed of counter 200. Weight 2450  
lbs. Export shipping weight 2900 lbs. Cubic measurement  
60 feet.

In ordering Chasers give LETTER as well as size wanted. Lubricate the Chasers with lard oil..

## The Merrell Ratchet Screw Plate.



FIG. 9.

Our object in placing this plate on the market is to give to the trade a better plate than has heretofore been made. The plate has our Standard Quick Opening and Closing Die Head, with Adjustable Chasers, 4 to the set. One set of chasers cuts the four sizes of pipe.

No. 3 Ratchet Screw Plate cuts 1, 1½, 1¾ and 2 inch...\$25 00

Extra Chasers, per set..... 2 50

## Internal Back Gears

FOR APEX and 8 and 12

POWER MACHINES.

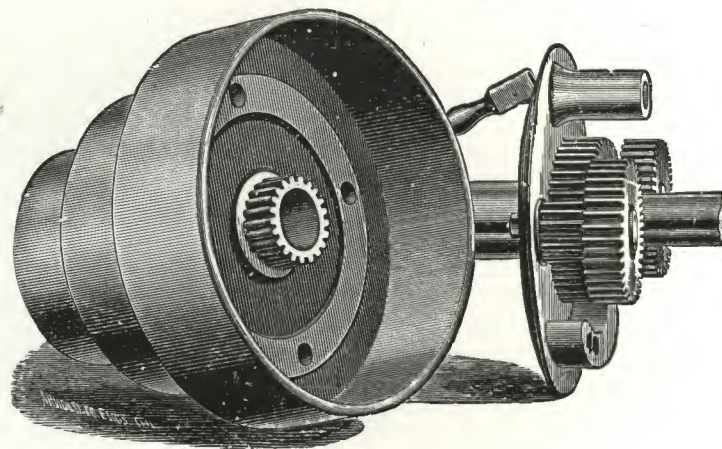


FIG. 10

## Improved Nipple Chuck,

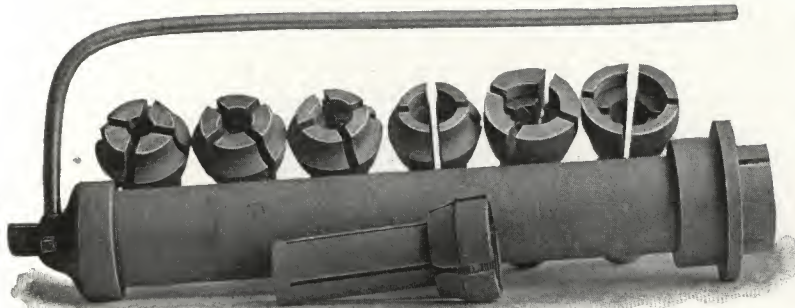


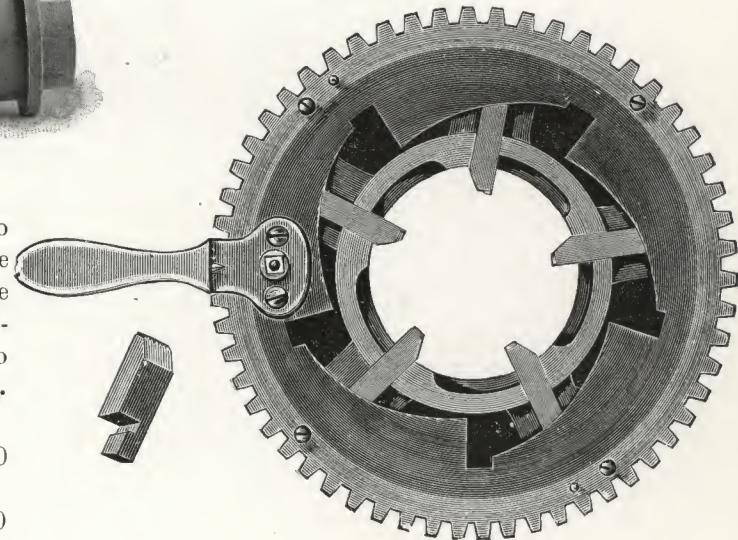
FIG. 11.

The splined cone of the nipple holder being drawn into the corresponding cone of the shell, grips the nipple to be threaded, a reverse movement of the cone opens the nipple holder by means of the wedge-shaped slots traversing corresponding guide blocks attached to the shell and inserted into said slots so that the nipple can be removed without turning.

No. 2 Nipple Chuck, with $\frac{3}{8}$ , $\frac{1}{2}$ , $\frac{3}{4}$ , 1, $1\frac{1}{4}$ , $1\frac{1}{2}$ and 2 in. holders, complete .....	\$40 00
No. 3 Nipple Chuck, with 1, $1\frac{1}{4}$ , $1\frac{1}{2}$ , 2, $2\frac{1}{2}$ , 3, $3\frac{1}{2}$ and 4 in. holders, complete.....	70 00
No. 4 Nipple Chuck, with $4\frac{1}{2}$ , 5 and 6 in. holders, complete.....	40 00

## Our Standard Quick Opening and Closing DIE HEAD.

SHOWING CAM MOVEMENT.



F.G. 12.



## Standard Sizes of Wrought Iron Welded Pipe.

Inside diameter nom.	Actual outside Diameter.	Thick-ness.	Actual inside Diameter.	External circum-ference.	Internal circum-ference.	Length of pipe per square foot of outside surface	Length of pipe per square foot of inside surface.	External area,	Actual internal area.	Length of pipe containing one cubic foot.	Weight per foot of length.	No. of threads per inch of screw.	Length perfect screw
$\frac{1}{8}$	.405	.068	0.269	1.272	0.848	9.440	14.15	.129	.0572	2500.	.243	27	0.19
$\frac{1}{4}$	.54	.088	0.364	1.696	1.144	7.075	10.50	.229	.1041	1385.	.422	18	0.29
$\frac{3}{8}$	.675	.091	0.493	2.121	1.552	5.657	7.67	.358	.1916	751.5	.561	18	0.30
$\frac{1}{2}$	.840	.109	0.622	2.652	1.957	4.502	6.13	.554	.3048	472.4	.845	14	0.39
$\frac{3}{4}$	1.050	.113	0.824	3.299	2.589	3.637	4.635	.866	.5333	270.0	1.126	14	0.40
1	1.315	.134	1.047	4.134	3.292	2.903	3.679	1.357	.8627	166.9	1.670	11½	0.51
1¼	1.660	.140	1.38	5.215	4.335	2.301	2.768	2.164	1.496	96.25	2.258	11½	0.54
1½	1.90	.145	1.61	5.969	5.061	2.010	2.371	2.835	2.038	70.65	2.694	11½	0.55
2	2.375	.154	2.067	7.461	6.494	1.611	1.848	4.430	3.355	42.36	3.667	11½	0.58
2½	2.875	.204	2.467	9.032	7.754	1.328	1.547	6.491	4.783	30.11	5.773	8	0.89
3	3.50	.217	3.066	10.996	9.636	1.091	1.245	9.621	7.388	19.40	7.547	8	0.95
3½	4.0	.226	3.548	12.566	11.146	.955	1.077	12.566	9.837	14.56	9.055	8	1.00
4	4.50	.237	4.026	14.137	12.648	.849	0.949	15.904	12.730	11.31	10.728	8	1.05
4½	5.0	.247	4.506	15.708	14.153	.765	0.848	19.635	15.939	9.03	12.492	8	1.10
5	5.563	.259	5.045	17.475	15.849	.629	0.757	24.299	19.990	7.20	14.564	8	1.16
6	6.625	.280	5.065	20.813	19.054	.577	0.630	34.471	28.889	4.98	18.767	8	1.26
7	7.625	.301	7.023	23.954	22.063	.505	0.544	45.663	38.737	3.72	23.410	8	1.36
8	8.625	.322	7.981	27.096	25.076	.444	0.478	58.426	50.039	2.88	28.348	8	1.46
9	9.688	.344	9.00	30.433	28.277	.394	0.425	73.715	63.633	2.26	34.677	8	1.57
10	10.750	.366	10.018	33.772	31.475	.355	0.381	90.762	78.838	1.80	40.641	8	1.68

Thread taper three-fourths inch to one foot.

\*All pipe below 1½ inches is butt-welded, and proved to 300 pounds per square inch; 1½ inch and above is lap-welded and proved to 500 pounds per square inch.

## CASING THREADS.

Nom- inal inside diameter	Threads to 1 inch of screw standard	Threads to 1 inch of Screw. SPECIAL.	Nom- inal inside diameter	Threads to 1 inch of screw standard	Threads to 1 inch of Screw. SPECIAL.
2 in.	14		5 in.	14	11½
2¼	14		5 ⅜	14	11½
2½	14		5 ⅝	14	11½
2¾	14		6¼	14	11½ 10
3	14	11½	6 ⅝	14	11½
3¼	14	11½	7¼	14	
3½	14	11½	7 ⅝	11½	
3¾	14	11½	8¼	11½	
4	14	11½	8 ⅝	11½	
4¼	14	11½	9 ⅝	11½	
4½	14	11½	10	8	
4¾	14	11½			

ENGLISH AND WHITWORTH.

## STANDARD THREADS.

1/8 inch Pipe.	Nominal inside Diameter 28 Threads to 1 inch Screw			
1/4 and 3/8 inch Pipe	"	"	19	"
1/2 and 3/4	"	"	14	"
1 to 7	"	"	11	"
8 inch Pipe	"	"	11	"
8 "	"	"	10	"
Above 8 inches,	"	"	10	"

**Table of Vulgar Fractions with Their Corresponding Decimals.**

1-64 inch..... .015625	17-64 inch..... .265625	33-64 inch..... .515625	49-64 inch..... .765625
1-32 " ..... .03125	9-32 " ..... .28125	17-32 " ..... .53125	25-32 " ..... .78125
3-64 " ..... .046875	19-64 " ..... .296875	35-64 " ..... .546875	51-64 " ..... .796875
1-16 " ..... .0625	5-16 " ..... .3125	9-16 " ..... .5625	13-16 " ..... .8125
5-64 " ..... .078125	21-64 " ..... .328125	37-64 " ..... .578125	53-64 " ..... .828125
3-32 " ..... .09375	11-32 " ..... .34375	19-32 " ..... .59375	27-32 " ..... .84375
7-64 " ..... .109375	23-64 " ..... .359375	39-64 " ..... .609375	55-64 " ..... .859375
1-8 " ..... .125	3-8 " ..... .375	5-8 " ..... .625	7-8 " ..... .875
9-64 " ..... .140625	25-64 " ..... .390625	41-64 " ..... .640625	57-64 " ..... .890625
5-32 " ..... .15625	13-32 " ..... .40625	21-32 " ..... .65625	29-32 " ..... .90625
11-64 " ..... .171875	27-64 " ..... .421875	43-64 " ..... .671875	59-64 " ..... .921875
3-16 " ..... .1875	7-16 " ..... .4375	11-16 " ..... .6875	15-16 " ..... .9375
13-64 " ..... .203125	29-64 " ..... .453125	45-64 " ..... .703125	61-64 " ..... .953125
7-32 " ..... .21875	15-32 " ..... .46875	23-32 " ..... .71875	31-32 " ..... .96875
15-64 " ..... .234375	31-64 " ..... .484375	47-64 " ..... .734375	63-64 " ..... .984375
1-4 " ..... .25	1-2 " ..... .5	3-4 " ..... .75	1 " ..... 1.0





